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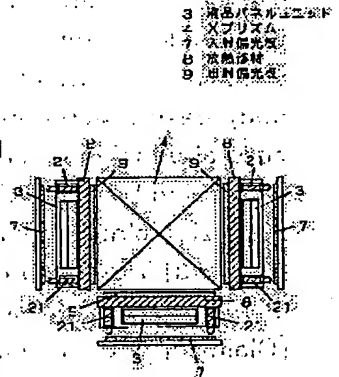
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(54) LIQUID CRYSTAL PROJECTOR

(57)Abstract:

PROBLEM TO BE SOLVED: To efficiently cool a liquid crystal panel and a polarizing plate constituting a liquid crystal projector.

SOLUTION: This liquid crystal projector is constituted of a lamp, a color separation means separating light from the lamp to red, blue and green components, a liquid crystal panel unit 3 modulating respective red light, blue light and green light, the polarizing plates 7 and 9 arranged on the incident light side and the emitting side of the unit 3, a heat radiating member 8, a color synthesis optical means synthesizing the modulated light, a projection lens projecting the synthesized light, and a main body case including the lamp, the liquid crystal panel, the polarizing plate, the color separation means, the color synthesis optical means, the heat radiating member and the projection lens. The member 8 and the unit 3 are arranged to get close to each other.



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CLAIMS

[Claim(s)]

[Claim 1] A lamp and the liquid crystal panel which modulates red, blue, a color separation means to dissociate green, said red and blue, and each green light for said lamp, The polarizing plate arranged to the incident light [of said liquid crystal panel], and outgoing radiation side, and the color composition optical means which compounds said modulated light, It is the liquid crystal projector which consists of a body case which connotes the projection lens which projects the compounded light, said lamp, a liquid crystal panel, a polarizing plate, a color separation means, a color composition optical means, a projection lens, etc. The liquid crystal projector characterized by carrying out the splice of radiator material and said liquid crystal panel mutually.

[Claim 2] A lamp and the liquid crystal panel which modulates red, blue, a color separation means to dissociate green, said red and blue, and each green light for said lamp, The polarizing plate arranged to the incident light [of said liquid crystal panel], and outgoing radiation side, and the color composition optical means which compounds said modulated light, It is the liquid crystal projector which consists of a body case which connotes the projection lens which projects the compounded light, said lamp, a liquid crystal panel, a polarizing plate, a color separation means, a color composition optical means, a projection lens, etc. The liquid crystal projector characterized by carrying out the splice of said polarizing plate, radiator material, and said liquid crystal panel mutually.

[Claim 3] The liquid crystal projector according to claim 1 to 2 characterized by carrying out the splice of the radiator material to the both sides of a liquid crystal panel.

[Claim 4] The liquid crystal projector according to claim 3 characterized by using radiator material as sapphire glass.

[Claim 5] The liquid crystal projector according to claim 1 to 4 characterized by having arranged a polarizing plate, radiator material, and a liquid crystal panel in a projection lens.

[Claim 6] The liquid crystal projector according to claim 1 to 4 characterized by carrying out the splice of the color composition optical means to an outgoing radiation side polarizing plate.

[Claim 7] The liquid crystal projector according to claim 1 to 4 characterized by arranging a cooling fan in either the upper part of a color composition optical means, or the lower part.

[Claim 8] The liquid crystal projector according to claim 7 characterized by supporting a cooling fan by radiator material.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the cooling structure of a liquid crystal panel or a polarizing plate especially about the liquid crystal projector which carries out amplification projection of the image of liquid crystal panels.

[0002]

[Description of the Prior Art] The equipment which carries out amplification projection of the image of a liquid crystal panel from the former using the light sources, such as metal halide, is proposed. It is condensed by the liquid crystal panel via a mirror etc., and the light emitted from the light source copies this out on a screen through a projection lens.

[0003] recently, a projection image can be seen by the big screen also in a bright chamber — as — high — brightness (it is the optical output of 3000ANSI lumens with 1.3 inch liquid crystal) — the micro projector (an equivalent for B5 size) using small liquid crystal panels; such as a thing, 0.9 molds, and 0.7 molds, has also appeared.

[0004] Consequently, it is supposed that the approach of cooling liquid crystal and a polarizing plate to a strong light from the light source is difficult, so that liquid crystal becomes small.

[0005] Drawing 16 shows the construct of the conventional liquid crystal projector. In drawing 16, the approach of consisting of each polarizing plate arranged, for example to the three incidence [of a liquid crystal panel and this liquid crystal panel] and outgoing radiation side as an approach of cooling a liquid crystal panel, and ventilating the clearance between a liquid crystal panel and a polarizing plate with a cooling fan is common (not shown).

[0006]

[Problem(s) to be Solved by the Invention] Temperature control is difficult for said conventional cooling approach in order to cool the front face of each configuration member, controlling a fan's air capacity.

[0007] Moreover, when using small liquid crystal like a micro projector, many each clearance (between a liquid crystal panel, between incidence polarizing plates and a liquid crystal panel, and outgoing radiation polarizing plates) cannot be taken, and a wind does not flow well. Consequently, the surface cooling of each liquid crystal panel or a polarizing plate became imperfect, and each device was not stored in the temperature specification.

[0008] This invention solves the above-mentioned technical problem, maintains each device (a liquid crystal panel, polarizing plate) in a temperature specification, and offers the liquid crystal projector which radiates heat efficiently.

[0009]

[Means for Solving the Problem] In order to solve said technical problem, the liquid crystal projector of this invention considered the heat component which generates heat with a polarizing plate or a liquid crystal panel as the configuration which radiates heat promptly by heat conduction.

[0010] The lamp which specifically fixed the arc tube near the focal location of the reflecting mirror equipped with the concave reflector, Three liquid crystal panels which have the polarization film which penetrates only the one direction of the flux of light by the side of incidence and outgoing radiation to both sides in order to modulate a color separation means to divide said lamp into red, blue, and a green light, said red and blue, and each green light, and are arranged at an abbreviation right angle, respectively, Said polarization film, the radiator material which cools three liquid crystal panel front faces, and color composition optical means, such as X prism which compounds the light modulated by said liquid crystal panel, It is the liquid crystal projector constituted from a body case which connotes the projection lens

which projects the light compounded, said lamp, said liquid crystal panel, said color separation means, said color composition optical means, radiator material, said projection lens, etc. It is characterized by carrying out the splice of said outgoing radiation side polarizing plate, radiator material, and said liquid crystal panel one by one.

[0011] Moreover, it is characterized by carrying out the splice of said incidence side polarizing plate, radiator material, and said liquid crystal panel one by one.

[0012] Moreover, it is characterized by arranging the cooling fan for air blasting or inhalation of air in either the upper part of a color composition optical means, or the lower part.

[0013] Moreover, radiator material makes light transmission possible and it is characterized by being the sapphire glass plate whose thermal conductivity is 40 – 45 W/mK.

[0014] Furthermore, it is characterized by having carried out the splice of an outgoing radiation side polarizing plate, radiator material, and said liquid crystal panel one by one, and having arranged in said projection lens.

[0015] This invention can perform cooling of a liquid crystal panel and a polarizing plate promptly by radiator material by the above-mentioned configuration. Consequently, the liquid crystal projector of the high brightness which can make [many] the quantity of light of lighting is made possible.

[0016]

[Embodiment of the Invention] The lamp which fixed the arc tube near the focal location of the reflecting mirror with which the 1st invention in this invention was equipped with the concave reflector, Three liquid crystal panels which have the polarization film with which only the one direction of the flux of light by the side of incidence and outgoing radiation penetrates said lamp in order to modulate red, blue, a color separation means to dissociate green, said red and blue; and each green light to both sides, and are arranged at an abbreviation right angle, respectively, Said polarization film, the radiator material which cools three liquid crystal panel front faces, and color composition optical means, such as X prism which compounds the light modulated by said liquid crystal panel, It is the liquid crystal projector constituted from a body case which connotes the projection lens which projects the light compounded, said lamp, said liquid crystal panel, said color separation means, said color composition optical means, said radiator material, said projection lens, etc. Since the splice of said outgoing radiation side polarizing plate, radiator material, and said liquid crystal panel is carried out one by one, even if the clearance between a liquid crystal panel and an incidence polarizing plate and the clearance between a liquid crystal panel and an outgoing radiation polarizing plate are small like a micro projector, natural air cooling becomes possible by radiator material.

[0017] Moreover, a cooling fan is arranged in either the upper part of a liquid crystal panel and radiator material, or the lower part, and still more efficient cooling is enabled air blasting or by carrying out inhalation of air.

[0018] Moreover, light transmission is possible for radiator material, and it is characterized by thermal conductivity being, the member, for example, the sapphire glass plate, of 40 – 45 W/mK.

[0019] Furthermore, the splice of an outgoing radiation side polarizing plate, radiator material, and said liquid crystal panel is carried out one by one, by the configuration arranged in said projection lens, an equipment configuration is small and the liquid crystal projector completed within one optical device called a projection lens can be offered.

[0020] Hereafter, the liquid crystal projector in the example of this invention is explained using a drawing.

[0021] (Example 1) Drawing 1 is the top view showing the configuration of the concept of the liquid crystal projector in the 1st example of this invention. The top view which made the cross section the parts of each polarizing plate, X prism, etc. which have arranged drawing 2 to the liquid crystal panel unit [in drawing 1], incidence, and outgoing radiation side, and drawing 3 show the front view which made a part of drawing 2 the cross section.

[0022] The configuration of the concept of the liquid crystal projector in this invention is explained using drawing 1 . The optical system of 3 plate type liquid crystal projector separates the color of the light

from a lamp (light source) 1 into red, green, and blue using two or more mirrors 2, and it is made it to carry out incidence to the liquid crystal panel unit 3, and it is compounded by the X prism 4 etc. and carries out amplification projection with the projection lens 5.

[0023] The incidence side polarizing plate 7 and the outgoing radiation side polarizing plate 9 are arranged at the flank of the liquid crystal panel unit 3, respectively.

[0024] By controlling the potentials on and off of each pixel, light control of all whites, all black, and halftone is performed, and color composition is carried out for every pixel.

[0025] Moreover, said liquid crystal panel unit 3 and each polarizing plate are carried in the optical base 10.

[0026] Furthermore, the splice of the liquid crystal panel unit 3 is carried out to the radiator material 8, being guided to four mounting pins 21 which extended from the radiator material 8, as shown in drawing 2 and drawing 3.

[0027] Moreover, the liquid crystal panel unit 3 and the radiator material 8 are being mutually fixed with UV adhesives etc.

[0028] Furthermore, it considered as the configuration which pinches the radiator material 8 in the outgoing radiation polarizing plate 9 arranged to the outgoing radiation side, and said liquid crystal panel unit 3. Furthermore, the fan 11 has been stationed to the near upper part of the X prism 4. The fan 11 is supported by the radiator material 8.

[0029] Heat transfer of the heat produced in the liquid crystal panel by the above-mentioned configuration is carried out to said radiator material 8, and the radiator material 8 is cooled by air blasting or inhalation of air of an air cooling without blower or a fan 11.

[0030] In addition, light transmission was possible for the radiator material 8, and thermal conductivity used it as the sapphire glass of 40 – 45 W/mK etc.

[0031] The liquid crystal projector of this invention cools a liquid crystal panel unit efficiently by the above-mentioned configuration.

[0032] (Example 2) Each polarizing plate which has arranged drawing 4 to the liquid crystal panel unit [which constitutes the liquid crystal projector in the 2nd example of this invention], incidence, and outgoing radiation side, the top view which made some X prism the cross section, and drawing 5 show the front view which made a part of drawing 4 the cross section.

[0033] The configuration of each polarizing plate arranged to the liquid crystal panel unit, incidence, and outgoing radiation side also in this case, X prism, etc. is the same as that of an example 1 substantially. The points which carried out the splice of the three polarizing plates 9 arranged to said outgoing radiation side to the side face of the X prism 4 differ.

[0034] Drawing 6 shows each polarizing plate arranged to the liquid crystal panel unit [in which another example in the 2nd example of this invention is shown], incidence, and outgoing radiation side, and the front view which made some X prism the cross section. In this case, the example which has stationed the fan 11 for heat dissipation in the lower part of X prism is shown.

[0035] Drawing 7 and drawing 8 show each polarizing plate arranged to the liquid crystal panel unit [in which another example in the 2nd example of this invention is shown], incidence, and outgoing radiation side, and the front view which made some X prism the cross section. In this case, the example which formed the radiation fin 12 in radiator material 8A at one is shown. The example to which drawing 7 has stationed the fan 11 for heat dissipation in the upper part of X prism, and drawing 8 show the example arranged in the lower part of X prism, respectively.

[0036] (Example 3) Each polarizing plate which has arranged drawing 9 to the liquid crystal panel unit [which constitutes the liquid crystal projector in the 3rd example of this invention], incidence, and outgoing radiation side, the top view which made some X prism the cross section, and drawing 10 show the front view which made a part of drawing 9 the cross section.

[0037] The configuration of each polarizing plate arranged to the liquid crystal panel unit, incidence, and outgoing radiation side also in this case, X prism, etc. is the same as that of an example 1 substantially.

[0038] In this example, the points which pinched radiator material 8B in which light transmission is possible with the outgoing radiation polarizing plate 9 and liquid crystal panel which have been arranged to the incidence side differ.

[0039] Drawing 11 shows each polarizing plate arranged to the liquid crystal panel unit [in which another example in the 3rd example of this invention is shown], incidence, and outgoing radiation side, and the front view which made some X prism the cross section. In this case, the example which has stationed the fan 11 for heat dissipation in the lower part of X prism is shown.

[0040] (Example 4) Each polarizing plate which has arranged drawing 12 to the liquid crystal panel unit [which constitutes the liquid crystal projector in the 4th example of this invention], incidence, and outgoing radiation side, the top view which made some X prism the cross section, and drawing 13 show the front view which made a part of drawing 12 the cross section.

[0041] The configuration of each polarizing plate arranged to the liquid crystal panel unit, incidence, and outgoing radiation side also in this case, X prism, etc. is the same as that of an example 1 substantially.

[0042] In this example, the liquid crystal panel unit 3 was pinched by two radiator material 8C, and it considered as the configuration which carries out the splice of the incidence polarizing plate 7 arranged to this radiator material 8C and 8C at the incidence side, and the outgoing radiation polarizing plate 9 arranged to the outgoing radiation side, respectively.

[0043] Drawing 14 shows each polarizing plate arranged to the liquid crystal panel unit [in which another example in the 4th example of this invention is shown], incidence, and outgoing radiation side, and the front view which made some X prism the cross section. In this case, the example which has stationed the fan 11 for heat dissipation in the lower part of X prism is shown.

[0044] (Example 5) Drawing 15 shows the top view which made the cross section some of each polarizing plates arranged to the liquid crystal panel unit [which constitutes the liquid crystal projector in the 5th example of this invention], incidence, and outgoing radiation side, X prism, and projection lenses.

[0045] The configuration of each polarizing plate arranged to the liquid crystal panel unit, incidence, and outgoing radiation side also in this case, X prism, etc. is the same as that of an example 1 substantially.

[0046] In this case, the example which has arranged each polarizing plate arranged to the liquid crystal panel unit [which was shown in the example 2], incidence, and outgoing radiation side, X prism, etc. in the lens-barrel of the projection lens 5 is shown.

[0047] By the above-mentioned configuration, the configuration of a liquid crystal projector is small and can be completed within one optical device called a projection lens.

[0048]

[Effect of the Invention] As mentioned above, according to this invention, like [in the case of using what has small liquid crystal, such as a micro projector,], even if it cannot take many each clearance between a liquid crystal panel, between incidence polarizing plates and a liquid crystal panel, and an outgoing radiation polarizing plate, natural air cooling becomes possible by radiator material.

[0049] Moreover, when the light source becomes high power, by preparing a fin in radiator material in one further, a heat sinking plane product increases and the heat dissipation effectiveness is increased further. Furthermore, heat dissipation is promoted by preparing a fan near the radiator material.

[0050] Furthermore, the miniaturization of equipment can be attained with constituting what sealed the polarization film and said liquid crystal panel front face by the side of each incidence of three liquid crystal panels, and outgoing radiation in one by radiator material, respectively in the lens-barrel of a projection lens.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] The top view of the concept of the liquid crystal projector in the 1st example of this invention

[Drawing 2] Each polarizing plate arranged to the liquid crystal panel unit [in drawing 1], incidence, and outgoing radiation side, the top view which made some X prism the cross section

[Drawing 3] The front view which made a part of drawing 2 the cross section

[Drawing 4] Each polarizing plate arranged to the liquid crystal panel unit [which constitutes the liquid crystal projector in the 2nd example of this invention], incidence, and outgoing radiation side, the top view which made some X prism the cross section

[Drawing 5] The front view which made a part of drawing 4 the cross section

[Drawing 6] Each polarizing plate arranged to the liquid crystal panel unit [in which another example in the 2nd example of this invention is shown], incidence, and outgoing radiation side, the front view which made some X prism the cross section

[Drawing 7] Each polarizing plate arranged to the liquid crystal panel unit [in which another example in the 2nd example of this invention is shown], incidence, and outgoing radiation side, the front view which made some X prism the cross section

[Drawing 8] Each polarizing plate arranged to the liquid crystal panel unit [in which another example in the 2nd example of this invention is shown], incidence, and outgoing radiation side, the front view which made some X prism the cross section

[Drawing 9] Drawing 9 is each polarizing plate arranged to the liquid crystal panel unit [which constitutes the liquid crystal projector in the 3rd example of this invention], incidence, and outgoing radiation side, and the top view which made some X prism the cross section.

[Drawing 10] The front view which made a part of drawing 9 the cross section

[Drawing 11] Each polarizing plate arranged to the liquid crystal panel unit [in which another example in the 3rd example of this invention is shown], incidence, and outgoing radiation side, the front view which made some X prism the cross section

[Drawing 12] Each polarizing plate arranged to the liquid crystal panel unit [which constitutes the liquid crystal projector in the 4th example of this invention], incidence, and outgoing radiation side, the front view which made some X prism the cross section

[Drawing 13] The front view which made a part of drawing 12 the cross section

[Drawing 14] Each polarizing plate arranged to the liquid crystal panel unit [in which another example in the 4th example of this invention is shown], incidence, and outgoing radiation side, the front view which made some X prism the cross section

[Drawing 15] The top view which made the cross section some of each polarizing plates arranged to the liquid crystal panel unit [which constitutes the liquid crystal projector in the 5th example of this invention], incidence, and outgoing radiation side, X prism, and projection lenses

[Drawing 16] The conceptual top view of the conventional liquid crystal projector

[Description of Notations]

1 Lamp

- 2 Mirror
 - 3 Liquid Crystal Panel Unit
 - 4 X Prism
 - 5 Projection Lens
 - 7 Incidence Polarizing Plate
 - 8, 8A, 8B, 8C Radiator material
 - 9 Outgoing Radiation Polarizing Plate
 - 10 Optical Base
 - 11 Fan
 - 12 Radiation Fin
-

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